REMARKS

Claims 1-23, 28-34, and 40-67 are pending in this broadening reissue application. The Examiner allowed claims 1-23, 48-55, and 63-67, and the Applicant has cancelled claims 24-27 and has amended claims 28, 40, 45-47, and 56. The Applicant thanks the Examiner for taking the time to speak with the Applicant's attorney, Bryan Santarelli, on 23 January 2002. As discussed below, all of the pending claims are in condition for allowance.

Original Patent

The Assignee will surrender the original patent, or will submit a declaration as to loss or inaccessibility of the original patent, after the Examiner allows all of the pending claims.

Objection to the Drawings as Containing Extraneous Marks

The Applicant is submitting a clean copy of the formal drawings on this date by Express Mail.

Rejection of Claims 28 – 33, 40-47, and 59-62 Under 35 U.S.C. § 112 1st and 2nd Paragraphs

During his conversation with the Applicant's attorney, the Examiner stated that this rejection stemmed from his not understanding how more than one of the claimed currents could change with temperature. Therefore, in addition to the Applicant's remarks in the Amendment mailed 28 August 2001, the Applicant explains here, with reference to the specification, how more than one current changes with temperature. Referring to equation (2) of the specification, IA changes with temperature because it is proportional to absolute temperature T. Referring to equation (3), IB changes with temperature because it is proportional to VBE, which, as is well known, has a temperature coefficient of about -2mv/°C. And referring to equations (4) and (5), IC and ID change with temperature because they are proportional to VT and –VT, respectively, and it is well known that VT has a temperature coefficient of about -2.5mv/°C.

In light of this discussion and the discussion in the previous response, the Applicant requests that the Examiner withdraw these rejections.

Double Patenting Rejection of Claims 24-27

The Applicant has cancelled these claims.

Rejection of Claims 28-33, 45-47, and 57-58 under 35 U.S.C. § 102(b) in View of U.S. Patent 5,430,395 to Ichimaru

Although this rejection is improper because Ichimaru issued after the priority date of the reissue application, the Applicant proceeds as if the latter rejection were made under 35 U.S.C. § 102(e). Furthermore, the Applicant assumes that the Examiner intended to reject claim 34 on the same grounds. As discussed below, the Applicant respectfully disagrees with this rejection.

Claims 28-34 and 57-58

Claim 28 as amended recites generating first and second currents that respectively change with temperature according to first and second polarities, combining the first and second currents to generate a reference current, and comparing the reference current to a third current that is dependent on a power-supply voltage.

For example, referring, *e.g.*, to FIG. 2 and columns 3-6 of the reissue application, the current source A causes T1 to draw a first current that is proportional to temperature, and the current source B causes T2 to draw a second current that is inversely proportional to temperature. T1 and T2 sink the first and second currents from the same node Vsum, thus combining them into a reference current. The inverters 20 and 22 compare this reference current to the Vcc-dependent current sourced by current sources C and D by pulling the node OUT up to Vcc if the Vcc-dependent current is greater than the reference current and by pulling the node OUT down to zero volts if the Vcc-dependent current is less than the reference current.

Conversely, Ichimaru does not disclose comparing a reference current to a supply-voltage-dependent current. Referring to Ichimaru's FIG. 1, Ichimaru discloses generating currents Ic8 and Ic9 having opposite temperature slopes and combining these currents at a node No to generate a current Io that flows through a load Ro. The

Examiner's position is that first and s cond currents Ic8 and Ic9 ar combin d into a reference current at nod No, and this reference current is compared to Io at the node No. But unlike the claimed third current, Io is not dependent on the supply voltage. Moreover, Ichimaru's reference circuit will not operate as intended if Io is dependent on the supply voltage. Specifically, as long as Vin has a minimum value, Ic8 and Ic9 are constant with respect to the supply voltage Vin. *See* column 9, lines 14-27. That is Ic8 and Ic9 are independent of Vin. And because Io equals Ic8 + Ic9, then Io is also independent of Vin. This makes sense because Vref, which depends on Io, is intended to be a stable reference voltage; but Vref would be unstable if it changed in response to changes in Vin.

Consequently, claim 28 and its dependent claims 29-34 and 57-58 are patentable over Ichimaru.

Claims 45-47

Claims 45-47 are patentable over Ichimaru for reasons similar to those recited above in support of the patentability of claims 28-34 and 57-58.

Rejection of Claims 59-62 under 35 U.S.C. § 102(b) in View of U.S. Patent 4,350,904 to Cordell

As discussed below, the Applicant respectfully disagrees with this rejection. Furthermore, Cordell is not cited on any form PTO-1449 or PTO-892. Therefore, because the Examiner cited this reference, the Applicant requests that he cite this reference on a form PTO-892 and send this form with his next action.

Claim 59 recites generating a reference current having a temperature coefficient, and comparing the reference current to a supply-related current that has or approximately has the same temperature coefficient.

For example, referring, *e.g.*, to FIG. 2 and columns 3-8 of the reissue application, the reference current IA + IB (generated by current sources A and B) has a temperature coefficient, and a supply-related current IC + ID (generated by current sources C and D) has the same or approximately the same temperature coefficient. Because both currents have the same or approximately the same temperature coefficient, the comparison voltage generated by these currents at the node VSUM is independent or

approximately independent of temperature. This prevents changes in temperature from altering the valu of Vcc at which the comparat r circuit of FIG. 2 causes the switching circuit 8 (FIG. 1) to switch between the primary and secondary power sources 4 and 5, respectively.

Conversely, Cordell teaches "comparing" currents having significantly different, not the same, temperature coefficients. Referring generally FIG. 1 and columns 1-4 of Cordell, the current source 10 of FIG. 1 generates a temperature-dependent bias current with a transistor 44 to offset temperature-induced changes in other transistors' (shown as "load") transconductance. That is, this bias current is used to maintain the transconductance of the transistors at a relatively constant level over a given temperature range. Specifically, the current source 10 generates a temperature-dependent current from the collector of the transistor 34, and the circuit 10 effectively compares this current to a temperature-independent current I2 from the collector of the transistor 20. Furthermore, the transistor 32 mirrors the temperature-dependent current from the transistor 34, and the circuit 10 effectively compares this current to a temperature-independent current I1 from the transistor 18. Consequently, because the compared currents have significantly different temperature coefficients, the "comparison" voltage at the node 22 changes with temperature, unlike the comparison voltage generated at the node VSUM (FIG. 1 of the reissue application), which does not.

Consequently, claim 59 and its dependent claims 60-62 are patentable over Cordell.

Objection to Claim 56

The Applicant has amended claim 56 into independent form to overcome this objection.

CONCLUSION

In light of the foregoing and in addition to the allowed claims 1-23, 48-55, and 63-67, claims 29-34, 41-44, and 57-62 as previously pending and claims 28, 40, 45-47, and 56 as amended are in condition for full allowance, and that action is respectfully requested.

If the Examin r believes that a phone interview would be h lpful, he is r spectfully requested t contact the Applicants' attorney, Bryan Santarelli, at (425) 455-5575.

DATED this 1st day of February, 2002.

Respectfully submitted,

GRAYBEAL JACKSON HALEY LLP

Bryan A. Santarelli
Attorney for Applicants
Registration No. 37,560
155-108th Avenue N.E., Ste 350
Bellevue, WA 98004-5901
(425) 455-5575

ALL PENDING CLAIMS SHOWING MARKED-UP VERSION OF AMENDED CLAIMS

Marked-up claims 28, 40, 45-47, and 56:

Claims 1-23. See issued patent.

28. A method, comprising:

generating a first current that changes with temperature according to a first polarity;

generating a second current that changes with temperature according to a second polarity;

combining the first and second currents to generate a reference current; and

comparing the reference current to a third current that is dependent on ~~related to~~ a power-supply voltage.

29. The method of claim 28 wherein:

the first current changes with temperature according to a positive polarity; and

the second current changes with temperature according to a negative polarity.

30. The method of claim 28 wherein:

the first current is proportional to temperature; and

the second current is inversely proportional to temperature

31. The method of claim 28 wherein:

the first current increases as temperature increases and decreases as temperature decreases; and

the second current decreases as temperature increases and increases as temperature decreases.

32. The method of claim 28 wherein combining the first and second currents comprises summing the first and second currents.

33. The method of claim 28 wherein combining th first and second curr nts comprises sinking the first and second currents from a node.

34. The method of claim 28 wherein combining the first and second currents comprises sourcing the first and second currents to a node.

40. A method, comprising:

generating a first current that increases as temperature increases and that decreases as temperature decreases;

generating a second current that decreases as temperature increases and that increases as temperature decreases;

generating a third current that is dependent on~~related to~~ a first voltage; and

combining the first, second, and third currents at a node to generate a second voltage on the node.

41. The method of claim 40 wherein combining the currents comprises:

sinking the first and second currents from the node; and

sourcing the third current to the node.

42. The method of claim 40 wherein:

the first current is related to a thermal voltage; and

the second current is related to a voltage across a forward-biased p-n junction.

43. The method of claim 40 wherein:

the first current is related to a thermal voltage; and

the second current is related to a base-emitter voltage of a bipolar transistor.

44. The method of claim 40 wherein the second current is related to the natural logarithm of a current through a bipolar transistor.

45. A m thod, comprising:

generating a first current that is r lated to temperature according t a first polarity;

generating a second current that is related to temperature according to a second polarity;

combining the first and second currents into a reference current;

generating a third current that is dependent on a first voltage; and

comparing the third current to the reference current.

46. The method of claim 45 wherein:

the first current is related to a thermal voltage;

the second current is related to a voltage across a forward-biased p-n junction; and

the third current is dependent on~~related to~~ a power-supply voltage.

47. The method of claim 45 wherein:

combining the first and second currents comprises sinking the first and second currents from a node; and

comparing the third current to the reference current comprises,

sourcing the third current to the node, and

comparing a second voltage on the node to a reference voltage.

48. A method, comprising:

generating a first current that is proportional to a threshold voltage of a field-effect transistor;

generating a second current that is proportional to a difference between a supply voltage and a threshold voltage of a second field-effect transistor;

generating a third current that is proportional to a base-emitter voltage of a first bipolar transistor;

generating a fourth current that is proportional to absolute temperature; and

driving a node with the first, second, third, and fourth currents.

49. The m thod of claim 48 wh rein driving the node comprises:
sourcing th first and second currents to the n de; and
sinking the third and fourth currents from the node.

50. The method of claim 48, further comprising comparing a voltage on the node with a reference voltage.

51. The method of claim 48 wherein the first field-effect transistor is matched to the second field-effect transistor.

52. The method of claim 48 wherein the threshold voltage of the first field-effect transistor is equal or approximately equal to the threshold voltage of the second field-effect transistor.

53. A method, comprising:

generating a first current that equals a product of a first constant and a threshold voltage of a first field-effect transistor;

generating a second current that equals a product of a second constant and a difference between a supply voltage and a threshold voltage of a second field-effect transistor;

generating a third current that equals a product of a third constant and a base-emitter voltage of a bipolar transistor;

generating a fourth current that equals a product of a fourth constant and a thermal voltage; and

driving a node with the first, second, third, and fourth currents.

54. The method of claim 53 wherein the first constant equals the second constant.

55. The method of claim 53 wherein driving the node comprises:
sourcing the first and second currents to the node; and
sinking the third and fourth currents from the node.

56. A method, comprising:

generating a first current that changes with temperature according to a first polarity;

generating a second current that changes with temperature according to a second polarity;

combining the first and second currents to generate a reference current; and

comparing the reference current to a third current that is proportional to a power-supply voltage

~~The method of claim 28 wherein the third current is proportional to the power-supply voltage~~.

57. The method of claim 28 wherein comparing the reference current comprises summing the reference current and the third current at a node.

58. The method of claim 28 wherein comparing the reference current comprises:

sinking the reference current from a node; and

sourcing the third current to the node.

59. A method, comprising:

generating a reference current having a first temperature coefficient; and

comparing the reference current to a supply-related current that is related to a power-supply voltage and that has or has approximately the first temperature coefficient.

60. The method of claim 59 wherein the reference current is independent of the power-supply voltage.

61. The method of claim 59 wherein comparing the reference current comprises summing the reference current and the supply-related current at a node to generate a voltage.

62. The m thod of claim 59, further c mprising:

wherein comparing the reference current comprises summing the reference current and the supply-related current at a node to generate a voltage;

connecting the power-supply voltage to a load if the voltage is greater than a predetermined level; and

connecting a secondary supply to the load if the voltage is less than the predetermined level.

63. A method, comprising:

generating a first current that is related to temperature according to a first polarity;

generating a second current that is related to temperature according to a second polarity;

combining the first and second currents into a reference current;

generating a third current that is related to temperature according to the first polarity;

generating a fourth current that is related to a supply voltage and that is related to temperature according to the second polarity;

combining the third and fourth currents into a supply-related current; and

comparing the reference current to the supply-related current.

64. The method of claim 63 wherein the fourth current is proportional to the supply voltage.

65. The method of claim 63 wherein the supply-related current is proportional to the supply voltage.

66. The method of claim 63 wherein:

the first and third currents are inversely proportional to temperature; and

the second and fourth currents are proportional to temperature.

67. Th dir ct current sum bandgap voltage comparator of claim 24 wherein $K_4 = K_1$.